

*Spatial Technologies and Concepts
A Division of*



Vector Product Format Database Update (VDU) Prototype for Digital Nautical Chart (DNC)

ECDIS-N Planning Conference

**Kevin Brown
SAIC**

**Kevin.T.Brown@saic.com
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UNCLASSIFIED

- **VDU DNC is a Critical Requirement for NIMA and U.S. Navy supporting “Safety of Navigation” Mission**
 - **Provides capability to mariners to electronically update their DNCs with the most current Navigation Safety Information**
 - **Required for Navy’s Electronic Chart Display and Information System – Navy (ECDIS-N) certification process**
 - **CNO “Paperless Bridge” Initiative**
 - + **Fleet-wide Navy transition from paper chart to electronic chart digital navigation in FY04**
 - + **USS Virginia class SSN design requirement need by July 2001**
 - + **Two Battle Groups will deploy with ECDIS-N certified systems in FY02**
 - *"Required to satisfy 31 July 2001, 33 CFR Part 164 authorization for U.S. Federal vessels to navigate using Federal agency approved electronic chart systems."*

- **Thorough Requirements Analysis for Updating DNC**
 - NIMA Internal Production
 - US Navy at Sea Operations
- **Develop Concept of Operation (CONOP)**
 - Update during development and testing
 - Address internal and external systems to NIMA
- **Design COTS Based Prototype VDU/DNC System**
 - Support both NIMA's and US Navy's needs and requirements
 - Consistent with USIGS architecture
 - Minimize size of update files and automate update process
- **Build Prototype Data Sets**
 - DNC CD-ROM #17 (US East Coast, NT Platform)
 - DNC CD-ROM #13 (US West Coast, NT & Unix Platform)
- **Conduct/Support Testing and Evaluation (T&E)**
 - Developmental (NIMA)
 - Operational (US Navy Platforms/Sites)

- **Disciplined Systems Engineering Process**
- **COTS Based Commercial “Patch-File” Technology**
- **Rapid Prototyping/Spiral Development**
- **Development & Operational Test & Evaluation**
- **Integrated Product Team (IPT)**
 - **NIMA Production, Systems Engineering, and Customer Support**
 - **Navy**
 - + **CNO N096, CNMOC, NAVOCEANO**
 - + **CINCLANTFLT/CINCPACFLT**
 - + **SUBLANT/SURFLANT**
 - + **NAVSEA (USS Virginia Class Submarine, VMS), NSWC (VMS)**
 - + **CNO N6, SPAWAR (NAVSSI, FUND)**
 - **USCG - COMDAC INS**
 - **Litton Marine Systems- Voyage Management System (VMS) / ECDIS-N**
 - **DND Canada, Offshore Systems Limited- ECPINS / ECDIS**

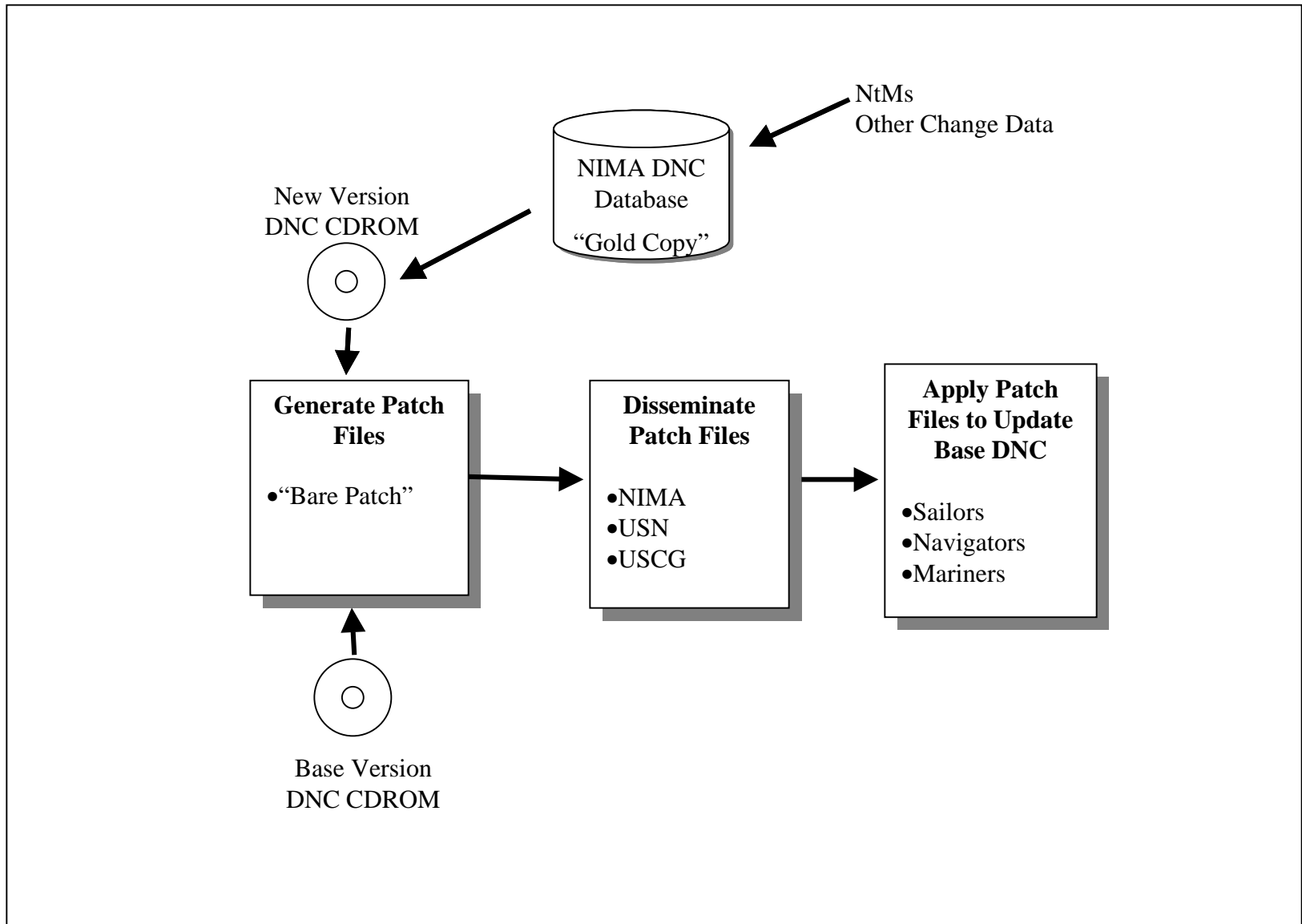
- ✓ 15 Sep 00 Kick-off
- ✓ 25 Oct 00 System Requirements Review (SRR)
- ✓ 17 Jan 01 Preliminary Design Review (PDR)
- ✓ 30 Jan 01 Demo/Test Spiral #1 (NIMA Hydro-NPC)
- ✓ 13 Mar 01 Demo/Test Spiral #2 (NIMA DCAFE)
- ✓ (14-31) Mar 01 “Shore-side” Pre-Operational “at Sea” Demo/Test
- ✓ 17 Apr 01 Critical Design Review (CDR)
- ✓ (18 Apr – 08 Jun 01) Demo/Test Spiral #3 Operational “at Sea”
- ✓ 28 Jun 01 Finalize & Deliver CONOP & System Design
- ✓ 05 Jul 01 Deliver VDU DNC Prototype for Evaluation
- ✓ 27 Aug 01 Deliver Tech Report with Test Results

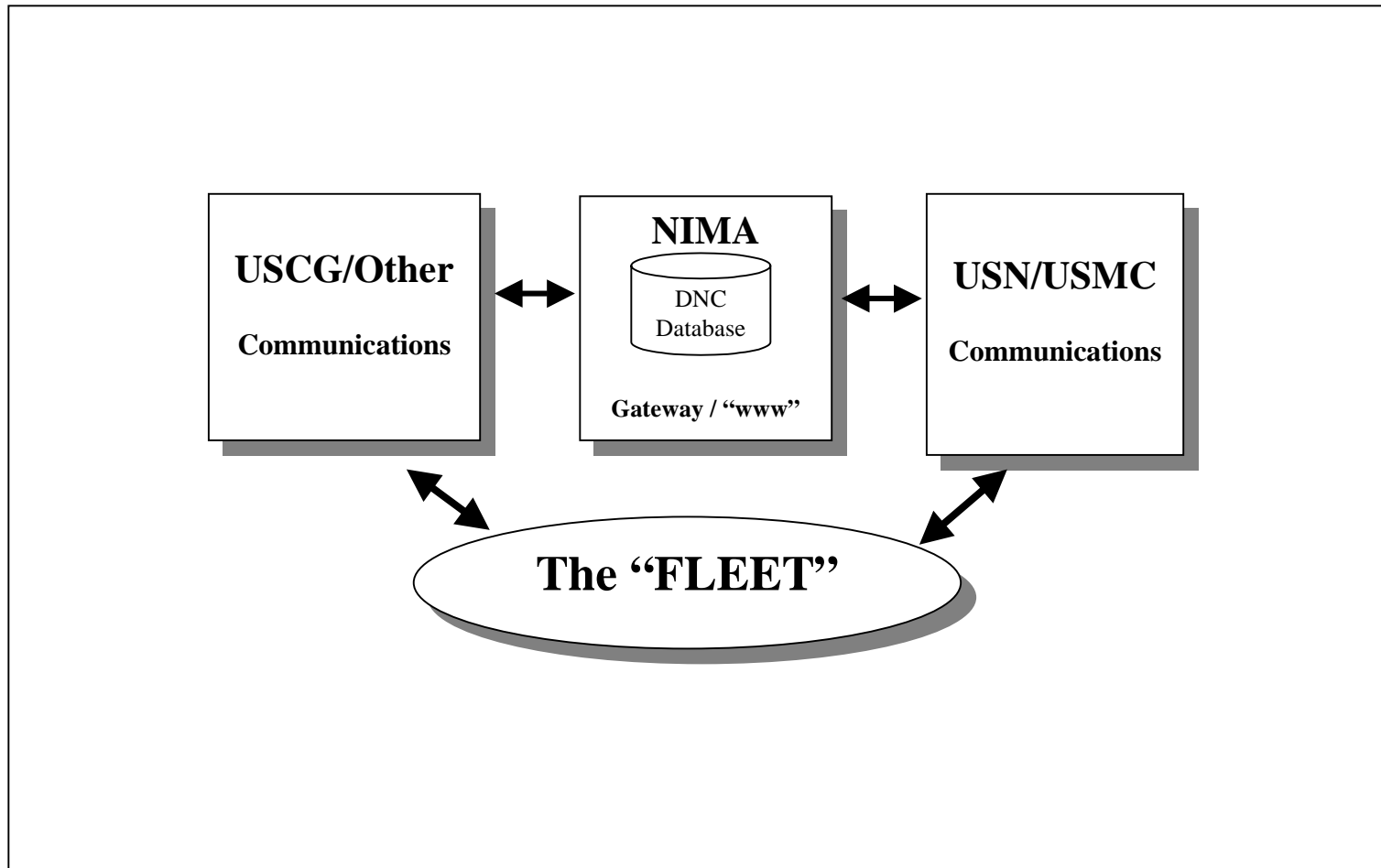
- By 01 Jul 2001, Virginia Class Needs:
 - VDU DNC Solution/Specification
 - VDU TOD/0/1/2/4 Solution/Specification
- Two Planned FY02 Battle Group Deployments with certified ECDIS-N

- **Use COTS “patch file” Technology to Update DNC**
 - Apply binary “patch files” to base DNC data

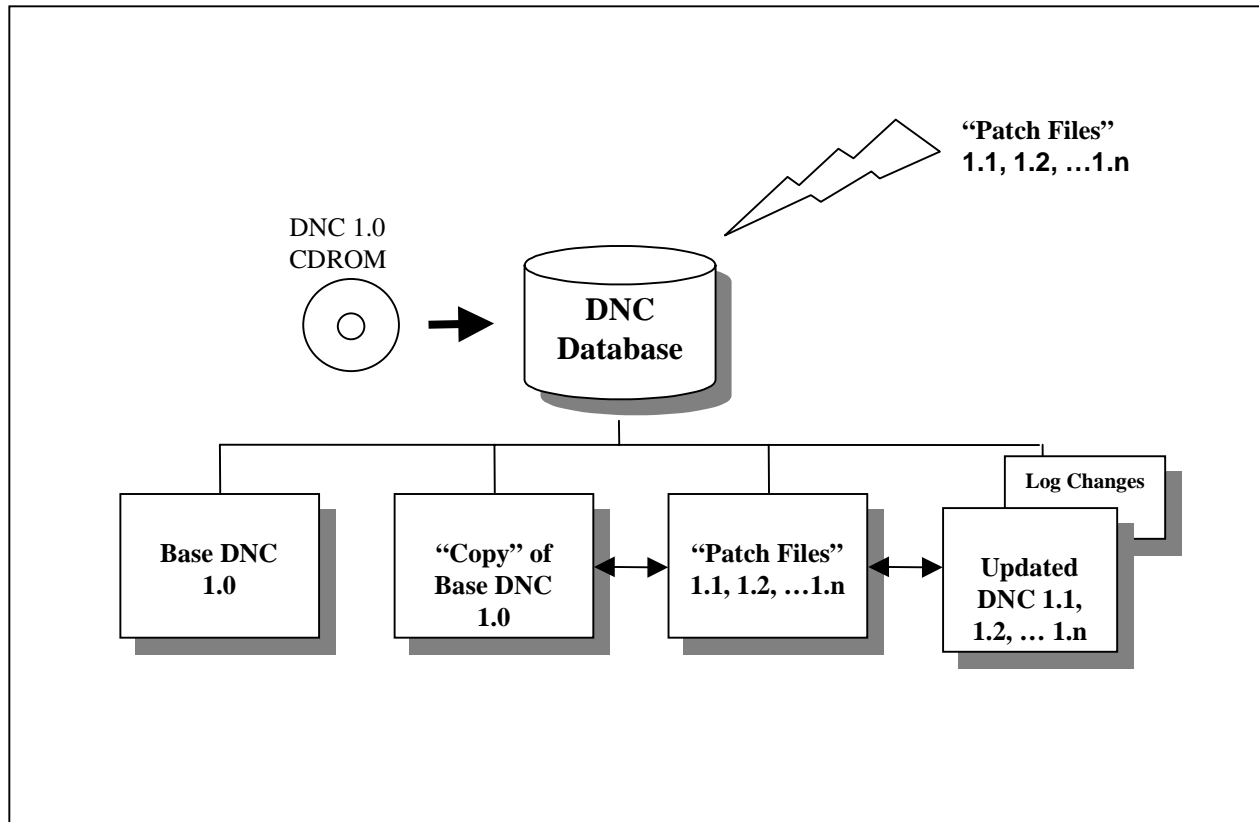
- **Spans Three Functional Areas**
 - Patch Generation (NIMA)
 - Patch Dissemination (Navy - NIMA)
 - Patch Application (DNC Users)

DNC Update Information Lifecycle

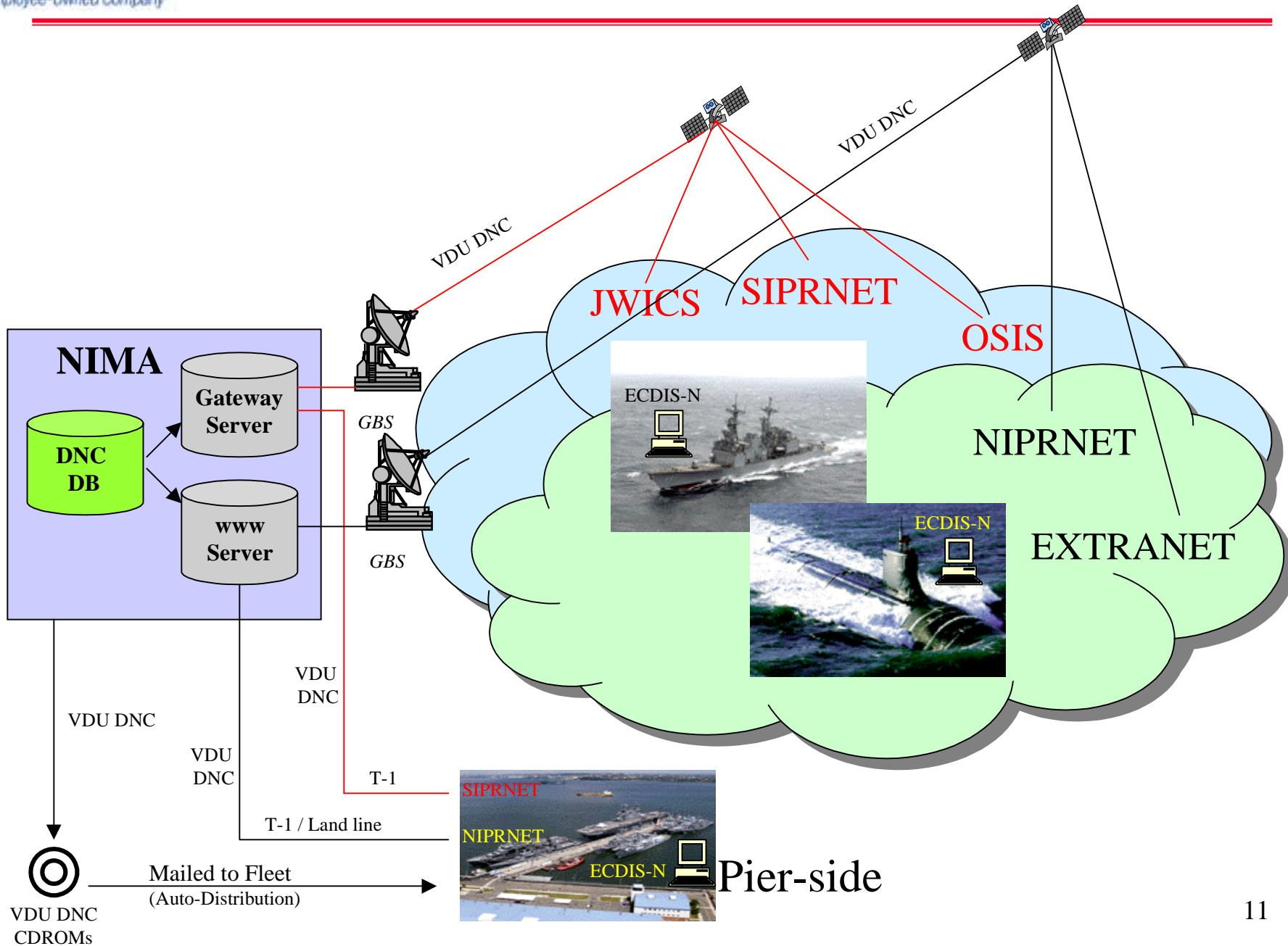




End-User DNC Update Data Flow



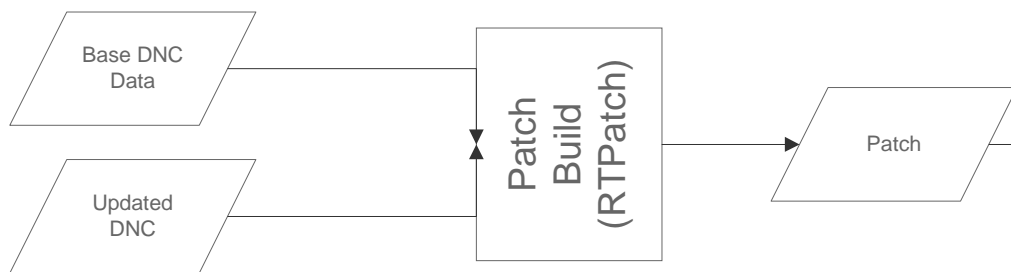
VDU DNC Architecture



- **“Patch file” Generation & Application Methods:**
 - **“Cumulative” Patch File Generation at Library/Port of Interest Level**
 - **“Bare Patch” Application**
 - + Minimal file size
 - + One-way electronic communications
 - + Meets NIMA & USN Security Requirements & Policies
- **Electronic “Smart Pull” from NIMA by users in a “web-enabled environment”**
 - **NIMA Gateway (SIPRNET, OSIS, JWICS)**
 - **NIMA NIPRNET/EXTRANET**
- **Most stringent bandwidth limited scenarios to date**
 - **Submarines and USCG Cutters**

Critical Design & System Requirements

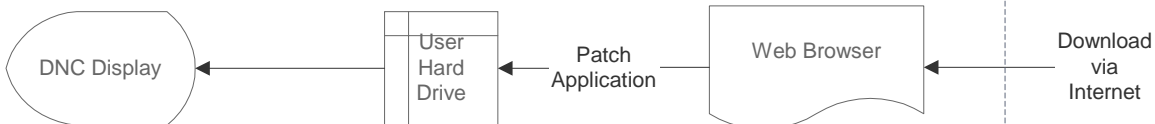
Patch Build



Patch Dissemination



Patch Apply



■ Build Patch

- Build software should be capable of building a binary patch given two dissimilar datasets that will bring a previously released dataset into agreement with the current dataset

■ Disseminate Patch

- The dissemination process should provide a mechanism for distributing patches to the user securely and reliably

■ Apply Patch

- Apply software should provide the user or systems integrator the capability to apply a patch to a previously released database, and the resultant database should be binary identical to the current database
- Apply software must be cross-platform (Windows, Solaris, HP-UX)

■ Build Patch

- CDROM differenced in 4 hours (may run off hours)

■ Disseminate Patch

- Patches for a library will vary between 5KB and 1MB
- Patches initially posted monthly, hopefully obtain shorter update cycles
- Download speed related to client bandwidth, generally less than 2-3 minutes for port of interest
- Digitally signed patches and apply utilities

■ Apply Patch

- Apply a patch for port of interest in less than 5 minutes
- DII COE compliant utilities

■ Build Patch

- Minimally intrusive in production environment
- Available on common platforms (Windows, Solaris, HP-UX)

■ Disseminate Patch

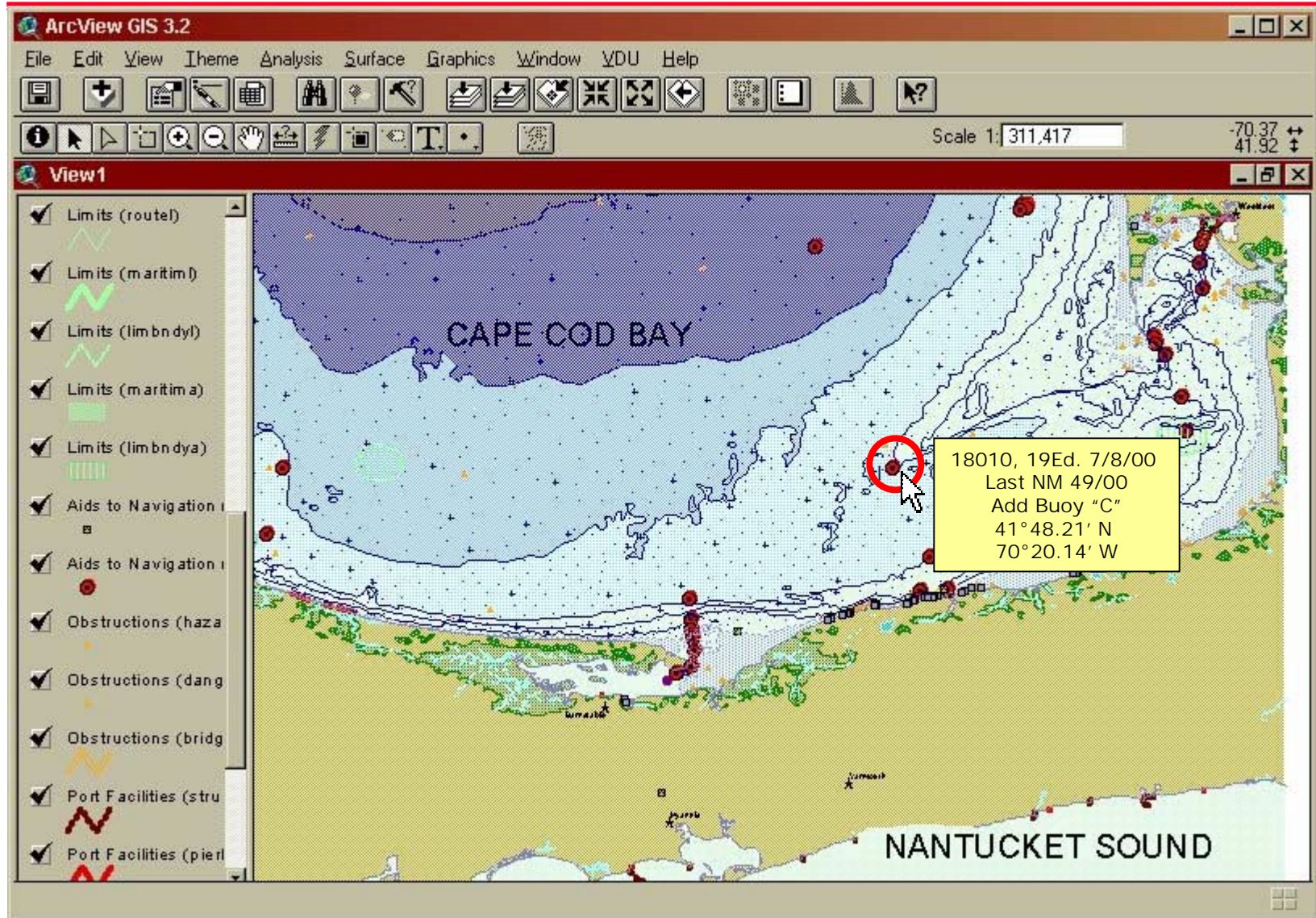
- Standard Web server and Web technologies

■ Apply Patch

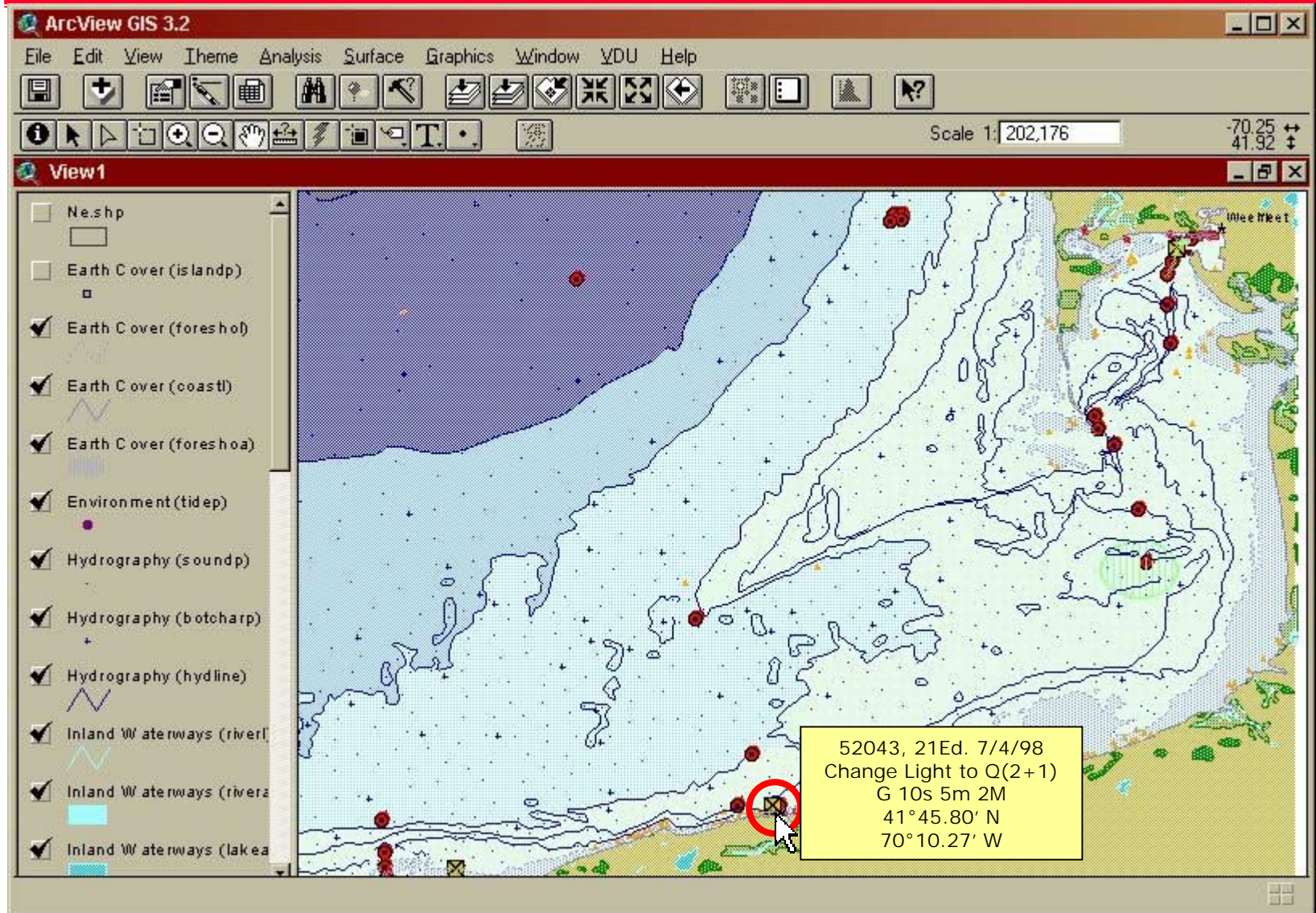
- Minimally intrusive in user environment
- Available on common platforms (Windows, Solaris, HP-UX)

Representative Sample of End-User Interface Displays

End-User Query on DNC Changes



End-User Query on DNC Changes



- **“Cumulative” versus “Sequential Patch”**
- **“Bare Patch” versus “Streaming Patch”**
- **Patch Generation at Library/Port of Interest Level versus both Library & Region Levels**
- **Notice to Mariner (NtM) Information Content and Currency Traceability at Library Level**

Demonstration / Testing

- **Temporarily Hosted on NIMA Gateway Servers since 14 Mar 01**
 - **CLAS**
 - + **SIPRNET**
 - + **JWICS**
 - + **OSIS**
 - **UNCLAS**
 - + **INTERNET (NIPRNET)**
 - + **USERID & PWD protected**

DNCD 17	Patch Volume (bytes)	Patch Apply Time (minutes) (CPU Speed & RAM?)	Name of System & Platform (if applicable?)	Date	Name Demo/Test Conductor
DNC17 Folder					
Volume Folder					
Patch Ed 12 to 13	22,442,338	Optional			
Patch Ed 12 to 14	31,777,358	Optional			
Patch Ed 13 to 14	13,865,748	Optional			
NORVA Libraries					
H1708280 (Norfolk & Little Creek)					
Volume Library					
Patch Ed 12 to 13	1,301				
Patch Ed 12 to 14	1,288				
Patch Ed 13 to 14	1,227				
A1708280 (Norfolk North)					
Volume Library					
Patch Ed 12 to 13	281,551				
Patch Ed 12 to 14	567,023				
Patch Ed 13 to 14	463,009				
COA17A (US East Coast/Charleston to Cape May)					
Volume Library					
Patch Ed 12 to 13	195,169				
Patch Ed 12 to 14	195,500				
Patch Ed 13 to 14	1,385				
COA17D (Chesapeake Bay)					
Volume Library					
Patch Ed 12 to 13	183,264				
Patch Ed 12 to 14	188,993				
Patch Ed 13 to 14	55,022				
GEN17A (US East Coast)					
Volume Library					
Patch Ed 12 to 13	1,669				
Patch Ed 12 to 14	347,484				
Patch Ed 13 to 14	347,484				

■ **Successful “Shore-side” Demo/Testing by:**

- **NAVSSI/COMDAC at USCG C2CEN Portsmouth**
- **VMS at NSWC Philadelphia**
- **FUND at SPAWARSCEN Little Creek, VA**
- **ECPINS at OSL Vancouver (with Displayed Update Layer)**
- **Desktop at CINCLANTFLT at NORVA**
- **Desktop at N096 using FUND**
- **NAVSSI at SPAWARSCEN San Diego**

■ NAVSSI Surface Platforms

➤ **USS Mahan (DDG-72)**

- + **Dates:** 05 (pier-side), 11&12 Apr 01 (u/w)
- + **Location:** NORVA to VA Capes
- + **POC Team Lead:** LCDR Jim Hudson
- + **Comm(s) Path:** SIPR, NIPR, INMARSAT

➤ **USS Milius (DDG-69)**

- + **Dates:** 28 Jun 01 (u/w)
- + **Location:** San Diego off-shore
- + **POC Team Lead:** QMC(SW) Roy Brown
- + **Comm(s) Path:** NIPR, INMARSAT-B

■ **VMS Surface Platform**

➤ **USS Monterey (CG-61)**

- + **Dates:** 02 May 01 (pier-side) 27 Jun 01 (u/w)
- + **Location:** NORVA to VA Capes
- + **POC Team Lead:** James Vaites (NSWC)
- + **Comm Path(s):** SIPR, NIPR, INMARSAT

■ **VMS Sub-surface Platform**

➤ **USS Boise (SSN-764) / USS Albany (SSN-753)**

- + **Dates:** 29 May 01, Boise (pier-side)
07-21 Aug 01, Albany (u/w)
- + **Location:** NORVA
- + **POC Team Lead:** ETCS (SS) Rob Zickau (SUBLANT),
- + **Comm Path(s):** SIPR

■ **ECPINS Surface Platform**

➤ **Canadian Navy “HMCS Ottawa”**

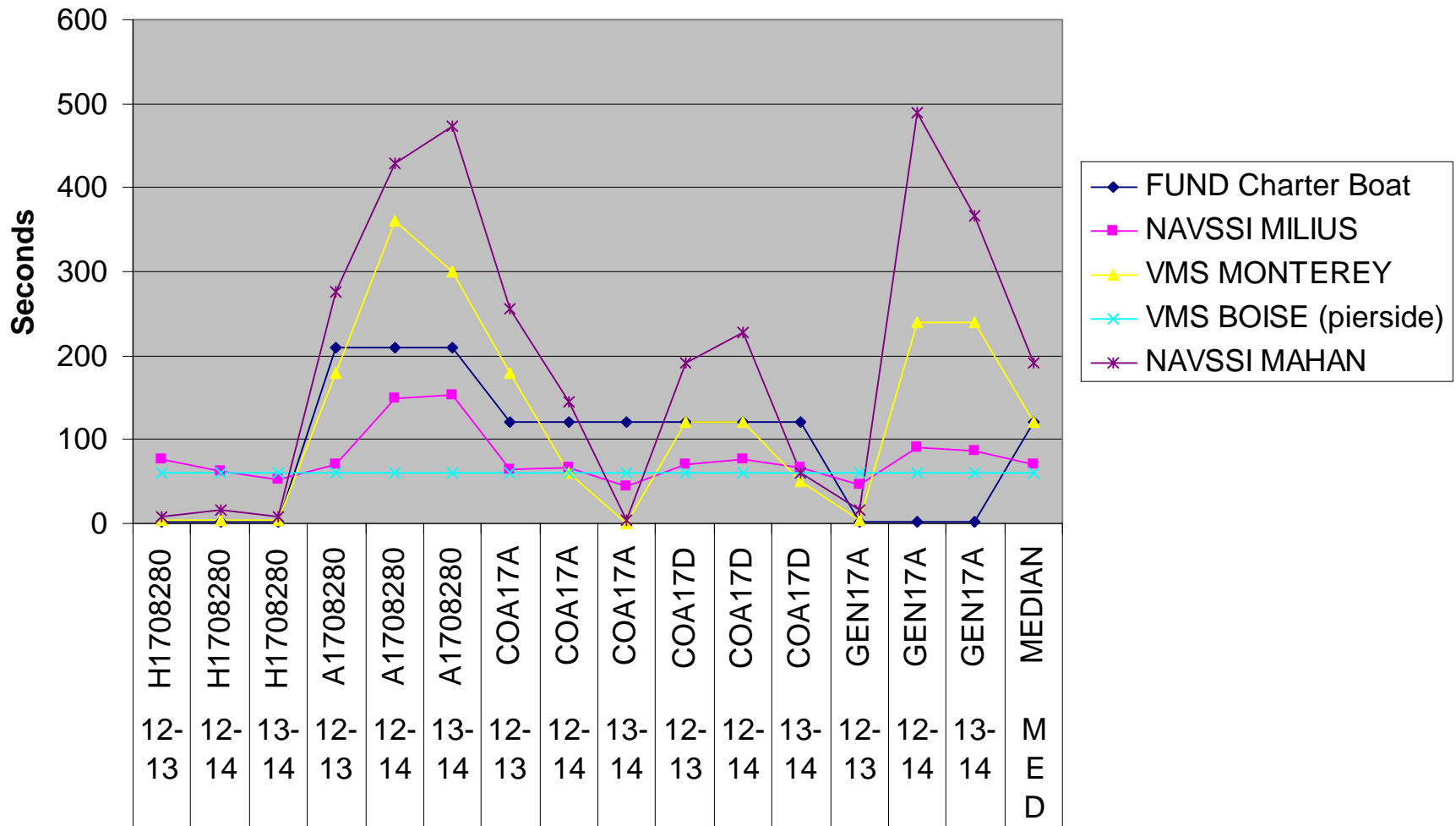
- + **Dates:** 08 May 01 (pier-side)
- + **Location:** Canada
- + **POC Team Lead:** Dan Andrew (OSL) POC

■ **FUND Surface Platform**

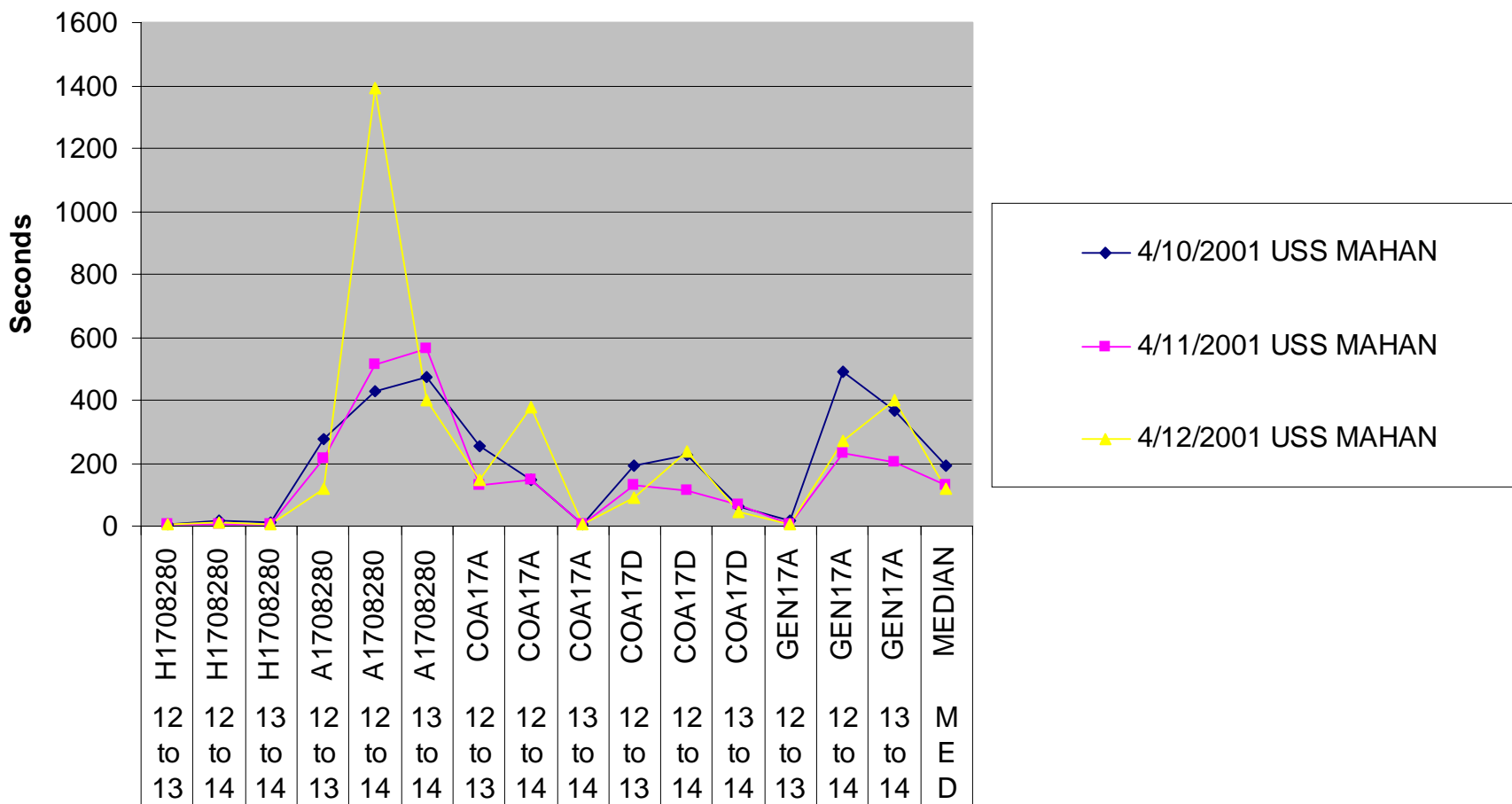
➤ **Private Charter Boat**

- + **Dates:** 29 Jun 01
- + **Location:** Chesapeake Bay
- + **POC Team Lead:** Rob Raper (SPAWAR Little Creek)
- + **Comm Path(s):** Internet Cell Phone

NORVA Libraries Downloads



NORVA Libraries Downloads



- **Development of Internal Navy CONOP for VDU DNC that describes how Navy will pull & disseminate VDU from NIMA Gateway servers via SIPRNET, NIPRNET, or other networks (JWICS, OSIS, EXTRANET) using Navy communications infrastructure**
- **Getting VDU from point of receipt (location) onboard the FLEET unit, to the ECDIS-N (location) onboard, to apply VDU and update navigation SDNC display**

- **Rapidly Developed a Viable and Deployable Operational Prototype Solution**
 - COTS based “patch file” technology
 - Successfully Demo/Tested internally at NIMA (Hydro-NPC, DCAFE) and externally at Navy shore-sites and on multiple surface/subsurface platforms

- **Developed well Documented VDU DNC Solution**
 - CONOP, System Design, Demo/Test Plan, Prototype Datasets
 - *Model for other VPF products requiring maintenance/periodic updates (Broad VDU solution)*

- **Employed Integrated Product Team (IPT) Approach with VDU DNC Stakeholders**
 - NIMA (DO, PCO, AT, & IS)
 - USN (N096, CINCs/Fleet, & OPNAV)
 - USCG (C2CEN)
 - DND Canada/Offshore Systems Limited (ECDIS vendor)
 - Litton Marine Systems (ECDIS vendor)

VDU Update Layer Specification Schedule
MIL-DTL-xxxxx

- MIL DRAFT Specification release for review - **31 August 2001**
- Specification TEM - **20 September 2001**
 - All changes must be submitted by this date
- Modifications due - **3 October 2001**
- NIMA approved document - **18 October 2001**
- SD-1 Review - **19 October to 19 December 2001**
 - If there are no changes resulting from SD-1 review the specification will be published in December 2001
- Additional Change Document Release - **4 January 2002**
- Modifications due - **6 February 2002**
- NIMA approved specification - **21 February 2002**
 - Publish specification in February 2002

NIMA PoCs: **Juli Jedetski (ATSD) - 703-755-5646**

LCDR Dave Howell (DFN) - 703-264-7283